

# PATENT SPECIFICATION

866,996

DRAWINGS ATTACHED.



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## COMPLETE SPECIFICATION.

### Improvements relating to Pipe Joints.

We, ATLAS BRADFORD COMPANY, formerly known as Atlas Pipe Inc., a Corporation organized and existing under the laws of the State of Texas, United States of America, of 14522 South Main Street, Houston 25, Texas, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to well pipe joints. In many usages, a closely fitted threaded engagement with appropriate thread lubricant will provide adequate sealing of the joint against leakage under pressure. However, where pressures are extremely high it has been found desirable to provide metal-to-metal contact over coating metal sealing surfaces. Ordinarily, such a seal is provided adjacent one end of the threaded engagement, usually the external end. However, in many instances it is desirable also to provide a seal at the internal end so that substances flowing through the pipe which may be corrosive or otherwise damaging to the threads will not be allowed to enter the threads. This is particularly true where the inner surfaces of the pipe are coated with plastic or the like for protection and the threads cannot be so protected. For this reason, even though it may be found that with certain types of metal-to-metal sealing engagement the pressure differential between the interior and exterior of a pipe may be held without leakage, it may be desirable to provide an additional seal which may or may not be of such a nature as to withstand by itself the differential pressures between interior and exterior of the pipe. Such seals have been heretofore provided but have consisted generally of rings, the ring being in a groove

in the female member and engaged by a taper surface on the male member so that when the two members are threaded together the tapered surface engaging the ring will force it radially more tightly into its groove and provide the sealing required. However, in order that such taper might be sufficient and yet not so steep as to tend to force the seal ring out of its groove, it has been required that extra turns be added to the amount of make up required for the joint. The minimum number of turns required for make up is however highly desirable.

It is therefore, an object of this invention to provide a well pipe joint in which an adequate deformable seal will be provided without necessity for excessive turns in the make up of the joint.

The well pipe joint according to the invention comprises a mutually engageable tapered screw threaded pin and box and a seal ring of flowable material in a groove in the box inwardly of the threads, characterized in that the ring fills the groove, the threads in the box run out into the groove, the thread on the pin is of an extent to enter the groove on full make up of the joint and place pressure on the ring, and the pin has an externally smooth end part projecting forwardly from the threads on the pin at least to the width of said groove and of a size to fit closely within the box adjacent the groove and close the groove against radially inward movement of the ring.

Our invention also comprises a box for a well pipe joint, said box having a female tapered thread therein and at the inner end of the thread a seal receiving groove, characterized in that the thread runs out into the groove and in that the box inwardly of the thread has a smooth bore of smaller diameter than the minimum thread diameter measured between thread crests.

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The invention will be further described with reference to the accompanying drawings which show by way of example one embodiment of the invention and in which:—

5 Figure 1 is a view partly in longitudinal cross-section and partly in elevation illustrating the pin and box of a joint constructed in accordance with this invention with the pin in position just before being stabbed into the box;

10 Figure 2 is a partial transverse section through the pin of Figure 1 taken along the line 2—2 of Figure 1 and shown on an enlarged scale to illustrate the terminal portion of the thread on the pin at its smaller end;

15 Figure 3 is a fragmentary longitudinal cross-section through one wall of the made up joint, the portion of the section which shows the pin being taken along the line 3—3 of Figure 2; and

20 Figure 4 is a view similar to Figure 3 but taken along the line of 4—4 of Figure 2.

The joint shown in the drawings comprises a pipe section 1 having an upset end portion 2 with a box portion 3 of a joint formed herein, and a second pipe section 4 having an upset end portion 5 thereon and a pin portion 6 formed on such upset end portion 5. In the instance illustrated the inside diameter of the pipe as shown at 7 is maintained within the upset end portion 2 of the box 3 and also within the upset end portion 5 of the pin 6 so that there will be no greater obstruction to flow through this joint than through the pipe sections joined thereby.

35 The box 3 is formed at its end with a radial sealing and bearing face 8 adapted when the joint is fully made up to bear against the endwise facing shoulder 9 formed adjacent the base of the threads of the pin member. This engagement provides not only a sealing engagement between these parts but also a positive stop to limit the amount of make up, provides for the transmission of torque through the joint when necessary, and provides stability in the joint against bending stresses.

40 Inwardly from the end face 8 the box 3 is provided with a tapered surface 10 adapted to be opposed to and slightly spaced from the tapered surface 11 on the pin 6 between the large end of the threads on the pin and the shoulder 9.

45 The female threads 12 in the box and the male threads 13 on the pin are modified buttress threads the details of which will be presently discussed. It is sufficient at this point to note they are relatively much shallower than conventional buttress type threads with respect to their pitch. Thus, they do not take up nearly as much radial space as conventional threads of the same pitch, yet because they are shallower the threads are wider and more rugged compared with their depth than are conventional

threads. Because of their shallowness, the amount of upset required on the end portions of the pipe sections is reduced to a minimum but this is without sacrifice to ruggedness, ease of manufacture, etc. Furthermore, it is possible because of such shallowness to maintain a high joint efficiency which is represented by the thickness of the remaining wall at the last thread on the pin as represented by the letter "a" compared with the thickness of the pipe wall at a point where it is not upset as represented by the letter "b" on the pin end of the joint. On the box end this efficiency is represented by the smallest dimension in thickness of the metal of the joint which in this instance is the bottom of the seal ring groove and is represented by the letter "c", divided by the thickness of the pipe beyond the upset as represented by the letter "d".

70 At the inner ends of the thread 12 of the box member there is provided in accordance with this invention a seal ring receiving groove 14. This should be at least as deep as the depth of the threads but not substantially deeper, because if deeper it would reduce the efficiency of the joint. This groove 14 is so positioned that the threads 12 run out into the groove, thereby making it possible for male threads engaging the female threads 12 to be threaded in until they extend into the groove 14. The male threads 13 on the pin are so sized that when fully made up the smaller end of this thread will extend into the groove 14 by an amount sufficient to compress the seal ring 15 in such groove and cause it to sealingly engage not only the bottom of its groove but also the nose portion 16 on the pin. This nose portion is externally smooth and is adapted to fit within the box and fairly snugly within that portion of the box 17 on the opposite side of the groove 14 from the threads 12 so that this smooth portion 16 substantially closes the groove 14 in a radial direction. The portion 16 need be only long enough that it will extend across the groove 14 by the time the end of the thread 13 begins to enter the groove so that the ring 15 will be confined in the groove 14 by the part 16 before it begins to be compressed by the entry of the thread 13 into the groove. By this arrangement it will be seen that as soon as the thread begins to enter the groove it will begin to compress the seal ring on one side and since the thread tapers from a full thread until it vanishes at its end as shown at 18 (Figure 2), this initial compression of the seal ring by the thread will extend over substantially half of the diameter of the pipe. Furthermore, the locus of this compression will rotate with respect to the seal ring and box as the tightening continues and will expand until substantially the entire circumference of the seal ring is being compressed

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by the end of approximately one-half turn of the thread into the box. Thus, by the advancement of the thread into the groove to somewhat over one-half turn, the seal ring may be compressed sufficiently to provide the necessary seal. This is compared with two or more turns required to compress the seal ring by the previously practiced method of forcing a tapered nose on the pin into the interior of the seal ring or forcing a tapered zone in the box onto a seal ring on the pin.

The position of the parts with the leading end of the thread on the pin compressing the seal ring as just described, is shown in Figures 3 and 4. Figure 3 is taken in a position to show the seal ring with a full inclined face of thread compressing it. Figure 4 is taken in a position to show the vanishing portion of the end of the thread advanced into the seal ring to compress it somewhat, with the next full thread likewise bearing on the seal ring to compress it. It is to be noted that the front or leading face of the thread where it advances into the groove 14 to engage the seal ring 15 is on the same angle as the front face of the remaining threads on the pin, namely approximately 45 degrees with respect to the axis of the joint.

The parts are so proportioned that the threads come into hand tight engagement just before the end surface 8 comes in contact with the shoulder 9.

The seal ring 15 may, of course, be made of any suitable sealing material but one sealing material which has been found highly satisfactory is tetrafluorethylene.

#### WHAT WE CLAIM IS:—

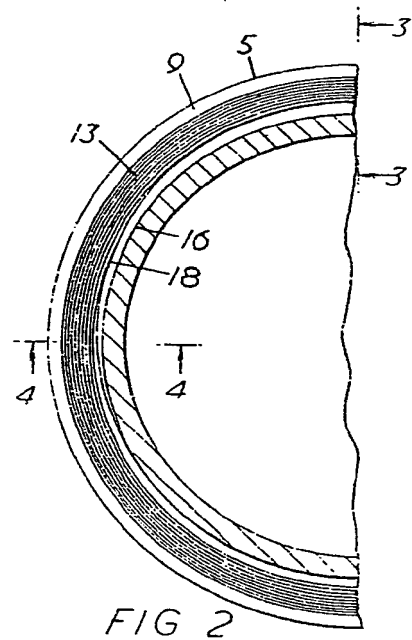
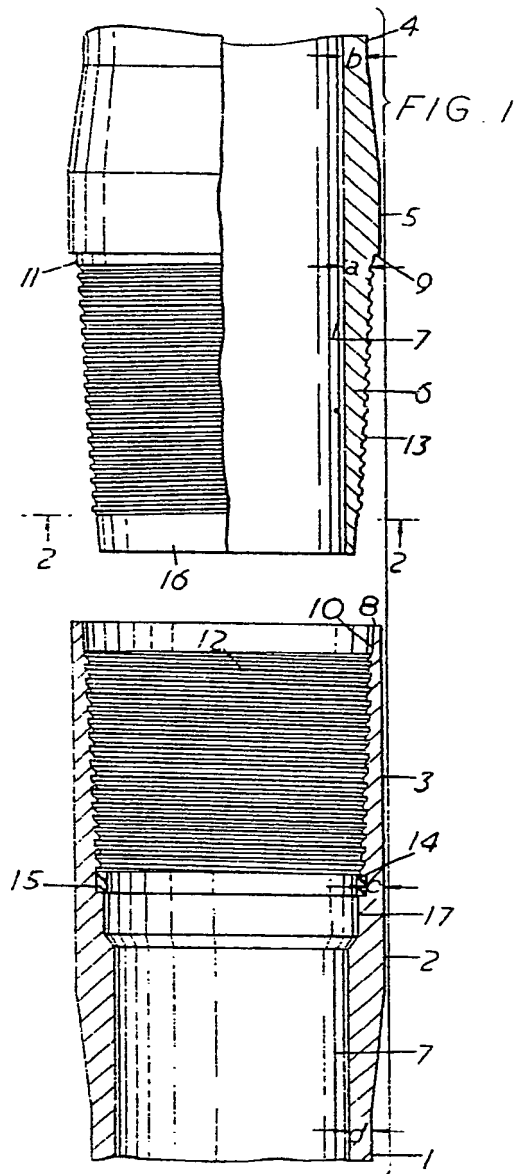
1. A well pipe joint comprising a mutually engageable tapered screw threaded pin and box and a seal ring of flowable material in a groove in the box inwardly of the threads, characterized in that the ring fills the groove, the threads in the box run out into the groove, the thread on the pin is of an extent to enter the groove on full make up of the joint and place pressure on the ring, and the pin has an externally smooth end part projecting forwardly from the threads on the pin at least to the width of said groove and of a size to fit closely within the box adjacent the groove and close the groove against radially inward movement of the ring.

2. A box for a well pipe joint, said box having a female tapered screw thread therein and at the inner end of the thread a seal receiving groove, characterized in that the thread runs out into the groove and in that the box inwardly of the thread has a smooth bore of smaller diameter than the minimum thread diameter measured between thread crests.

3. A well pipe joint substantially as hereinbefore described and as shown in the accompanying drawings.

4. A box for a well pipe joint substantially as hereinbefore described and as shown in the accompanying drawings.

ALLAM & TREGEAR,  
Chartered Patent Agents,  
2 & 3 Norfolk Street,  
Strand, London, W.C.2,  
Agents for the Applicants.



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SHEETS 1 & 2

FIG 3.

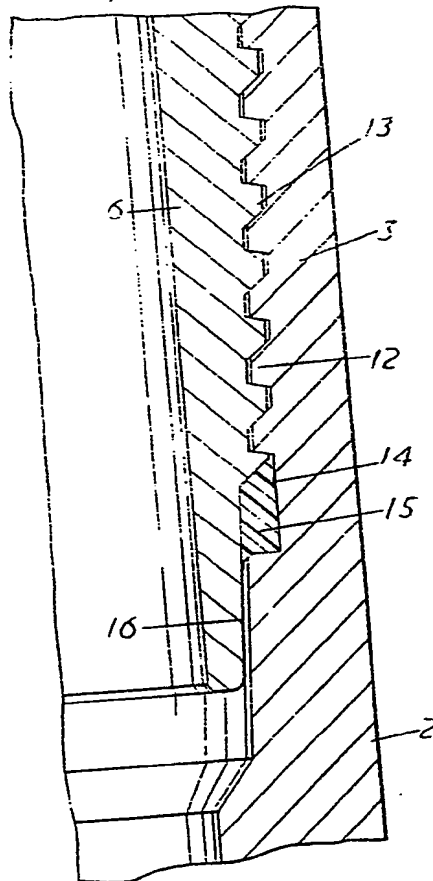
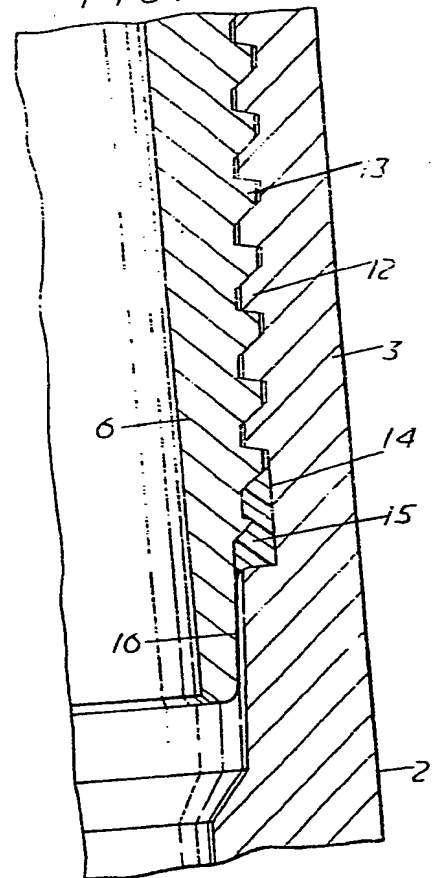
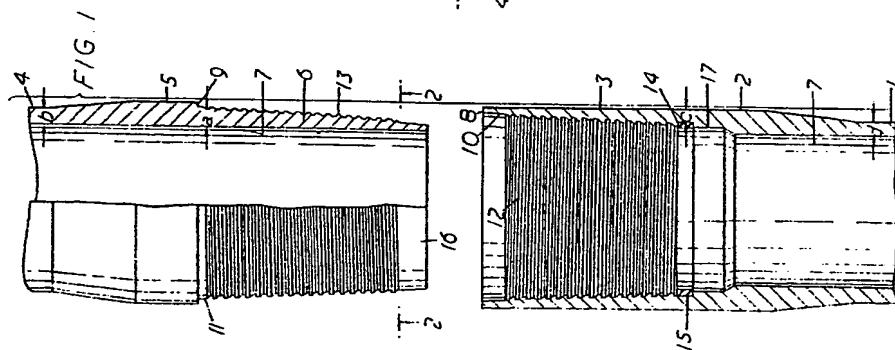
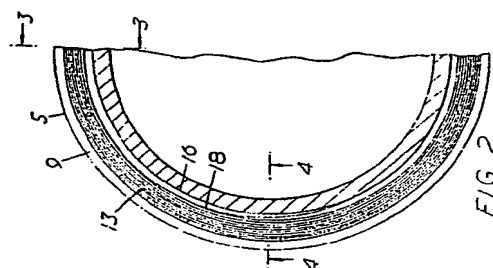
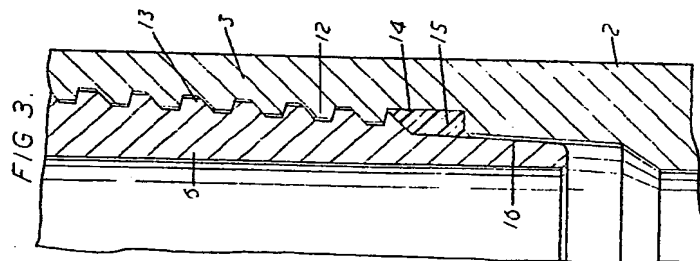
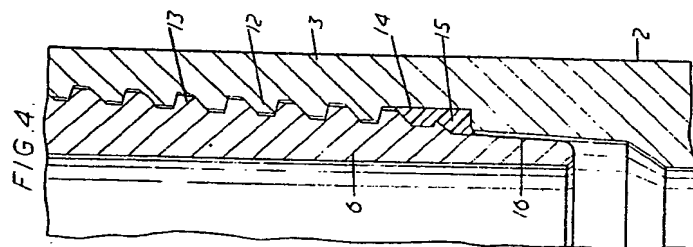


FIG 4.



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